SAVING ENERGY ACTION LOAN

85-1036/

Saving Energy Action Loan

The SEAL loan program provides an interest free loan of up to $1,500 to Yukon homeowners and landlords for the purpose of making residential energy improvements.

Message From the Government

Yukoners spend $90 million annually on refined oil products in order to meet our energy requirements. This level of dependency upon oil is not only a strain on individual Yukoners but it is also a terrible handicap to Yukon's economy.

Thirty-five per cent of this oil budget goes toward space and water heating in the commercial and residential sectors. Although it is not the largest component of our oil expenditures it is the area where we can effect the greatest reductions through prudent management practices.

This government has, for the past two years, been monitoring the effects of retrofitting homes through various demonstration programs. We believe that the potential for energy savings in the residential sector is great. We believe that retrofits will save Yukoners significant amounts of fuel oil and we believe this active form of controlling energy can act as a stimulus to the building industry.

We also believe that retrofits can bring added comfort to the home through the reduction of drafts and the balancing of temperatures throughout the house. Reduced fuel expenditures and added comfort will mean an enhanced standard of living for Yukoners.

These are the reasons this government has introduced the SEAL loan program. The initial costs of the retrofit can be a disincentive to performing the work. The SEAL loan program is designed to help cope with the costs of labour and materials for energy-efficient upgrading of homes.

Energy conservation means the reduction of wasted energy. It represents an investment in your future and in the future of Yukon.

Howard Tracey
Minister of Economic Development and Tourism

Step-by-step procedure for SEAL loan program.

1. Read this pamphlet carefully.
2. Contact the Energy Branch in order to arrange for an energy analysis.
3. Plan out your strategy based on the results of the energy analysis.
4. *(You may at this time wish to consult with staff at the Energy Branch to obtain advice.)* Obtain at least one estimate from a contractor if you plan to contract the work.
5. Sign the loan agreement with the Energy Branch.
6. Do the work or arrange to have the work done by an eligible contractor.
7. Save all invoices for processing with SEAL, CHIP and COSP.
8. Bring in relevant invoices to the Energy Branch.

Energy Branch,
Department of Economic Development,
and Tourism
Government of Yukon
Box 2703, Whitehorse, Y.T. Y1A 2C6
668-5471
Toll free **(Zenith 3083)**

Definition of a Retrofit

Retrofit: ***The thermal improvement of a existing house or structure.***

The retrofit should not be thought of only as the expensive total rewrap, a process which involves the construction of an exterior shell over the building, upgrading of windows, below-grade insulation and furnace improvements. This is, of course, a retrofit. But any improvement of the thermal characteristics of a building is a retrofit. Caulking, sealing, weatherstripping, furnace tune-ups, added glazing to windows, insulation, window shutters and solar additions can all by themselves or in concert with other measures be a retrofit.

The SEAL Program

The Saving Energy Action Loan is designed to assist homeowners in improving the thermal efficiency of their dwellings and reduce their energy requirements and expenditures. This assistance is intended to supplement the monies available through CHIP and COSP and lead to greater energy conservation investment throughout Yukon.

Program details:

- The program will provide a maximum of $1,500 interest free loan per dwelling unit;
- The repayment term is a maximum of 36 months;
- The loan must be approved prior to any materials being ordered or work being done;
- The loan may be applied to materials or labour as long as the labour is provided by an eligible contractor (that is, charges for own labour are not eligible);
- A caveat may be placed against the house to secure the loan;
- The loan is repayable in full when the house is sold unless the new owner is willing to assume payments;
- When the loan is approved, payment can be made directly to the contractor or the materials' supplier, if desired by the homeowner.

Eligibility Criteria:

- All registered homeowners and landlords are eligible;
- The house must be a principal residence of the owner or tenant;
- The maximum loan is $1500 per dwelling unit;
- The maximum number of dwelling units for which a person may receive a loan in the same year is seven
- detached, semi-detached, row houses, apartment buildings and mobile homes are all eligible;
- SEAL does not apply to homes under construction or those completed after April 1, 1984, unoccupied homes, summer homes or cottages;
- Homes which are eligible for CHIP and COSP funding are required to exhaust these sources before using SEAL. SEAL may not be used toward the homeowner's contribution to CHIP and COSP.

Eligible Materials and Work:

- Storm windows and doors;
- Insulated doors (CMHC accepted);
- Attic vents;
- Ventilation devices;
- Weatherstripping, caulking and sealing;
- Sealed window units (CMHC accepted);
- Vapour barrier materials (CMHC accepted);
- Framing and fire protective (but not decorative) covering where required by building codes for perimeter basement walls being insulated;
- Automatic furnace set-backs (CSA approved);
- Insulation of walls, attics and basements to at least minimum standards;
- Air sealing materials (CGSB accepted);
- Framing and service extensions for exterior retrofits;
- Low-flow showerheads;

Notes:

All applications must be supported by an energy audit done by a recognized trained auditor or by self-analysis by the homeowner using the HOTCAN program or an acceptable equivalent.

When contractors are used they must have Yukon Retrofit Certification issued by the Department of Education and Manpower. Contractors performing work eligible for funding under CHIP and COSP must be CGSB listed.

Random inspection of the work will be conducted to maintain program standards.

Applications:

In order to apply for the SEAL loan you will need:

1. an energy analysis performed by HOTCAN simulation or by a qualified energy auditor, and

2. an estimate for the work you chose to have done.

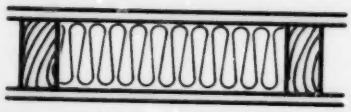
The loan agreement will form the basis of the application form

Metric:

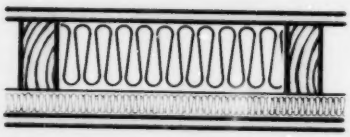
Insulation values are given in metric RSI units rather than the commonly used R. To calculate RSI from R divide by 5.7. A normal 2x6 wall insulated with fibreglass batts (R-20) would have an RSI value of 3.5.

Insulating frame walls

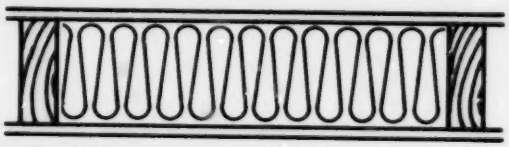
Uninsulated 2x4



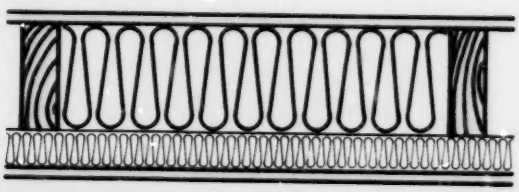
2x4 RSI 2.1



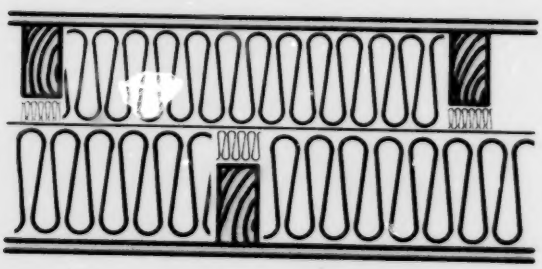
2x4 RSI 3.0



2x6 RSI 3.5



2x6 RSI 4.7



Heat Loss in the Home

Heat loss in the home occurs three ways; through air leakage, heat transfer and furnace inefficiency.

It is necessary to have fresh air entering the home for respiration, furnace combustion and to control humidity problems. However, almost all homes have far more than necessary. Excessive amounts of cold air enter the house through small cracks and openings around windows, doors, electrical outlets and pipes. As cold air enters, warm air exits; your fuel bills soar while your comfort levels drop dramatically.

Heat transfer is the movement of heat from warm to cold areas. Insulation inhibits this natural movement. The amount of insulation determines the amount of heat transfer through walls and ceiling.

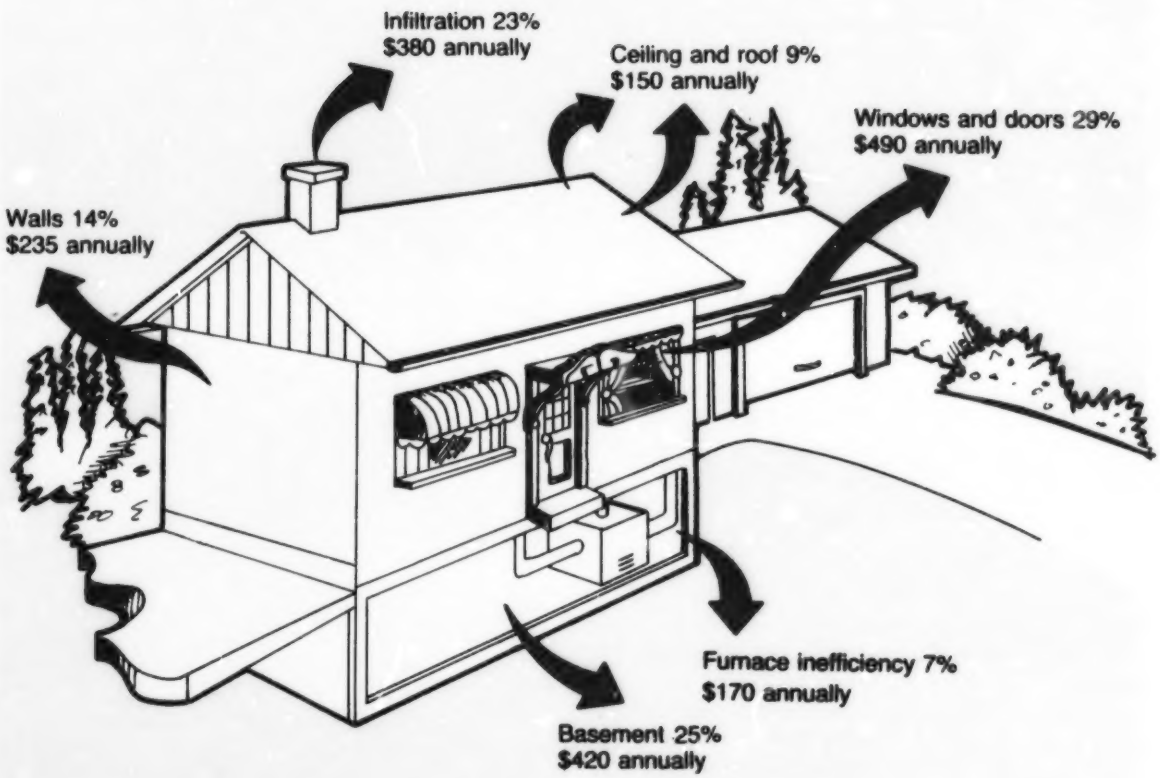
Windows are traditionally the area where the most heat transfer occurs. Glass is a very poor insulator. The insulation value of a window is determined by the trapped air in between layers of glass. A good triple-glazed window will reduce heat transfer by a factor of three compared to single pane windows and will be 1.5 times more effective that a double-glazed window.

Furnace efficiencies can vary anywhere between 25 and 85 per cent. Typically, the lower end of the scale - between 25 and 55 per cent - is the range for wood-burning applicances while oil furnaces are in the 50 to 85 per cent range. Most furnaces five or more years in age will have a maximum of 80 per cent efficiency. However, this efficiency will drop dramatically if the nozzle is too large, if the filter is dirty and if the furnace has not been tuned. Keeping an oil furnace in good shape can, by itself, save hundreds of dollars each year.

A good retrofit program will address each of the three areas of heat loss. The best approach is to develop a strategy for retrofitting your home.

The illustration on the facing page points out the average heat losses and the cost of those losses for a house with fuel consumption of 4,100 litres. It is a single-storey, 2 x 6 frame house. It is assumed that the house is insulated to RSI 3.5 in the walls and RSI 5.3 in the ceiling. It has double-glazed windows (window area is 15 per cent of floor space), two doors, fireplace, and a full concrete basement with no insulation above or below grade. It is further assumed that the house is located in Whitehorse.

It should be remembered that no two houses are exactly alike. The stipulation that SEAL loan applicants have an audit or HOTCAN analysis acknowledges this fact. The figures outlined in the illustrated house are true for this hypothetical house but not for yours. Only an energy analysis can determine how much energy your house loses from each area and only with that information can you make the best investment in your house.


Infiltration 23%
$380 annually
Ceiling and roof 9%
$150 annually
Windows and doors 29%
$490 annually
Walls 14%
$235 annually
Furnace inefficiency 7%
$170 annually
Basement 25%
$420 annually

Detailed Examination

There are five basic areas to examine when looking for ways to conserve energy: air sealing, basements, attics, walls and furnaces. Improving the thermal characteristics of each of these areas requires different levels of investment and results in varying amounts of savings. A detailed examination of each will help in planning your strategy.

1. Air Sealing

The amount of cold air entering a house varies with the size and number of openings, the temperature differential between the interior and the outside and the velocity of the wind. For most homes in Yukon, controlling the passage of cold air into the house will result in the greatest savings per dollar invested.

Windows:

Heat is lost through windows in two ways: through infiltration and conduction. Infiltration is the movement of air through the small cracks and openings around the window. As can be seen from the graphic below, air infiltration occurs around the sash, the meeting rail, under the rail, under the jambs and sill and through the shim space. In short, the window frame may be made up of 16 pieces and air will sneak around and under each section of the structure.

In order to reduce the leakage of air effectively, two types of measures should be taken. All the moveable parts of the window should be weatherstripped, and the other areas of infiltration should be sealed.

The best way to do this is to remove the interior trim and caulk the joints between the window frame and the wall and between the trim and the jamb and sill. It may also be necessary in old windows to remove the putty and apply new putty to insure the glass is firmly in place. *(When sealing, it is important to seal the interior. Sealing the exterior may cause moisture problems which will result in rot.*

Conduction is the movement of heat through a material. Glass is an efficient conductor of heat and as a result is almost worthless as an insulator. A single pane window is aided somewhat by the film of air immediately adjacent to both sides of the glass.

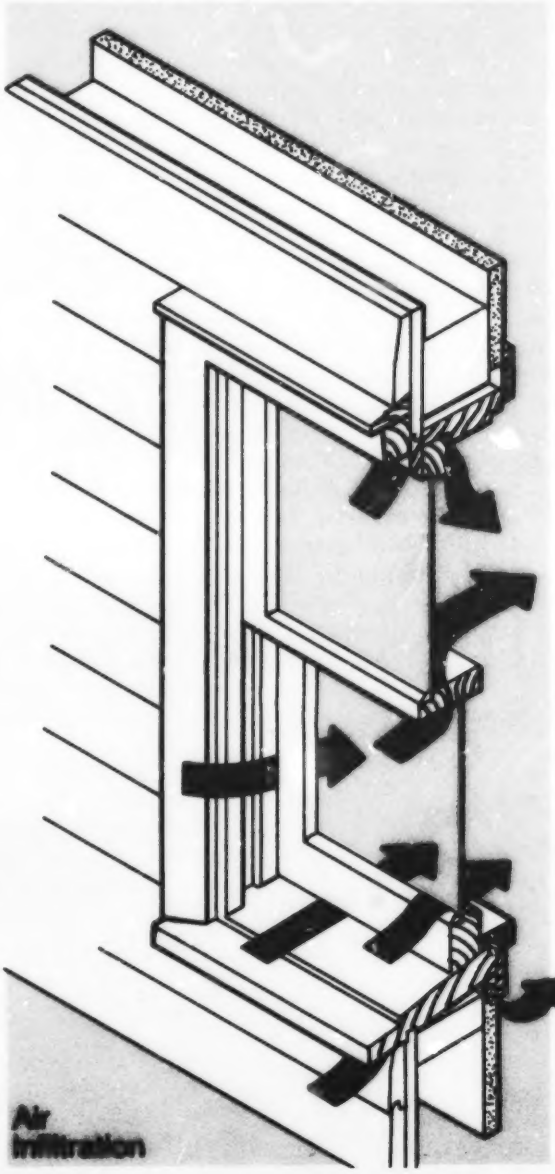


TABLE 1

Insulation Values of Windows

Type of Window	*Air Space*	*Insulating Value*
Single pane	-	RSI 0.16
Double pane	6mm	RSI 0.26
Double pane	12 mm	RSI 0.31
Triple pane	6 mm	RSI 0.37
Triple pane	12 mm	RSI 0.49

Windows begin to become relatively efficient insulators when two panes of glass trap a layer of air between them. This is commonly known, but what is not commonly understood by many people is that the amount of space between the glass is important.

The optimal air space is about 15 mm; spaces larger than this do not have any further thermal advantages. In fact, if the air space becomes too large (approximately 10 cm or greater) there are thermal losses resulting from convection within the air space.

One further area of concern is the frame. Heat transmission through a metal frame is extremely high. A wooden frame conducts heat 2,000 times slower than an aluminum one. If you prefer metal frames insure there is a thermal break in them.

Doors:

The same problems are faced with doors. A solid wooden core door will lose heat much more slowly than glass but more quickly than an insulated door, or a door with a storm on it.

The major problem with doors however, is infiltration. There is a large variety of reliable weatherstripping products on the market and one of these products should be used to seal those gaps around doors. Also pay some attention to air leakage between the door frame and the rough opening of the door. It might be necessary here again to remove the trim and seal with a caulking compound on the interior side.

Doors, like windows, will achieve a better seal if they are hinged, as opposed to sliding. The sliding door, like the sliding window, must be loose in order to operate. There is no effective way to stop the heat losses caused by the loose fit.

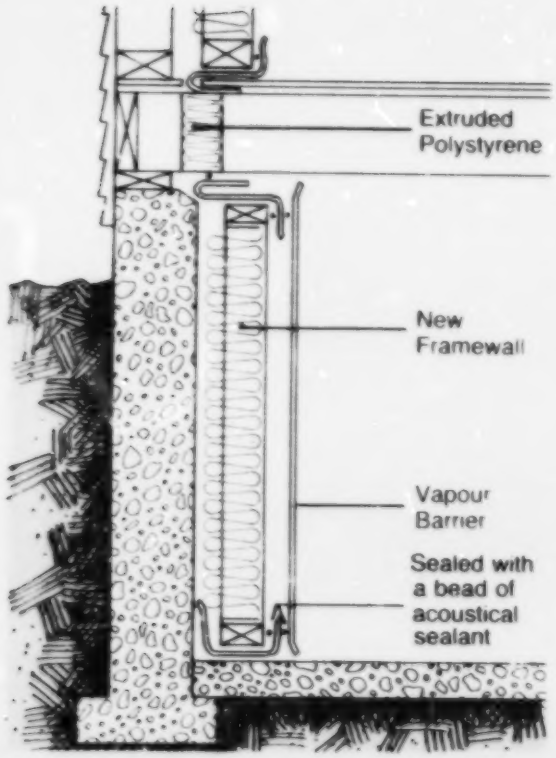
Pipe penetrations and wiring:

All air-vapour penetrations by wiring and pipes should be sealed at the air-vapour barrier. Usually they are not and the penetrations become areas of severe heat loss. The only way to alleviate the problem since you can't go back into the wall and rectify it, is to seal them at the wall. For pipes, this can be done with a caulking compound if the gap is small enough or with a caulking compound and poly. There are handy gaskets which can be purchased to go underneath the plastic plates on electrical outlets and switches which act as reasonably effective seals.

2. *Basements*

Basements can be insulated on the inside or the outside. If your basement is undeveloped, the easiest approach is probably on the inside and the most cost effective way is often with a wood frame, filling the cavity with fibre glass insulation which offers the greatest insulation value for cost.

The method shown is effective and quick. Placing the frame away from the basement wall provides a thermal break. A vapour barrier is placed on the



warm side of the frame and then it can be covered with whatever the homeowner wants.

Difficulties may be encountered in tight spots in the basement - behind the furnace, for example. Here the homeowner can resort to a less voluminous material. Care should be taken with pipes which should not be enclosed within the insulated wall.

If the basement is finished, the best solution is to insulate on the exterior to a depth of 0.6 m below grade. Particularly if you're going to be replacing siding and adding insulation to the walls this is a good solution, and the two jobs can be done in one step.

Again, care should be taken when approaching this task. The costs of excavating around the perimeter of your house can be high. Also, below grade insulation presents a different approach and some advice should be obtained from experts.

3. Attics

Preparation for insulating an attic is time consuming but essential. Seal all breaks in the vapour barrier, caulk and seal all openings leading to the house exterior. Use good quality materials and be thorough.

If the original insulation is in batt form, adjust the batts to eliminate any major gaps. You can add loose fill or batt insulation yourself, or have it blown in by a contractor. Blown insulation is often the best method in houses where the attic spaces are small and difficult to get at. Use insulation without a vapour barrier when adding to existing insulation.

The attic hatch is like a door to the outside. Weatherstrip and insulate the existing hatch, and install sash locks to hold it snugly against the weatherstripping.

Make sure you have adequate outside air ventilation and that insulating materials do not block the attic vents. For a low pitched roof, you should have one square foot of ventilation for every 150 square feet of attic floor space. For a normal or high pitched roof, allow one square foot of ventilation for every 300 square feet of attic floor space.

4. Walls

It is generally not economical to add insulation to walls that already contain some insulation. However, major renovations present an excellent opportunity for adding insulation at the same time. If you're renovating part or all of your house, add insulation and a well-sealed vapour barrier before installing the new wall covering.

New siding generally adds very little insulation value to walls. Carefully evaluate the thickness and type of insulation used if the siding is insulated.

If your exterior insulation needs replacing, you can remove the existing siding, wrap the house with a durable vapour barrier and add a stud frame system. Fill it with batt insulation, and cover it with building paper, sheathing and new siding. Or you can remove the existing siding, add a durable vapour barrier, apply rigid foam board and then cover it with new siding. Remember that two-thirds of the total wall insulation must be on the cold side (in winter) of the new vapour barrier.

It is recommended that homeowners obtain technical advice before proceeding with extensive wall renovations.

5. The Furnace

A furnace-efficiency test is part of the audit procedure. The furnace efficiency test will also be done as part of regular furnace maintenance. It should be considered essential since an inefficient furnace could be costing the homeowner hundreds of dollars annually.

The furnace efficiency test will, very simply, calculate how efficiently your furnace is burning its fuel. An oil burner should be burning its oil at about 70-75 per cent efficiency. If it is only operating at, say, 60 per cent efficiency then you could be paying 25 per cent (or $300 more on a $1,500 fuel bill) more than you should be each year.

A furnace tune-up, cleaning and proper nozzle sizing will more than pay for itself each year. The average price for an annual check up is under $50 (in Whitehorse) and the costs of the filters and nozzles are quite low. Your furnace efficiency will rise 10 per cent with this annual maintenance, and it will extend the life of your furnace.

An option to obtain greater furnace efficiency is the retention head burner. Basically, it is a method of obtaining a more complete combustion of the oil. (Manufacturers of retention head burners claim a 20-25 per cent increase in efficiency. But numbers can be confusing. A furnace with 60 per cent efficiency might with annual maintenance and a retention head burner improve to 80 per cent efficiency. This is an increase of 33 per cent, but half of the increase must be attributed to the maintenance.) Undoubtedly, the retention head burner will improve the combustion efficiency but by how much depends upon the furnace. There are several models of retention head burners on the market and they range in price from $350 to $700.

Turning down the thermostat at night and when you're away during the day will lower your fuel bills. Automatic set back thermostats can be installed by the do-it-yourselfer and usually pay for themselves in less than two years. They allow you to set your thermostat lower than you would manually, and still come home or wake up to a comfortable home.

TABLE II

Cost of Furnace Inefficiency

	60% efficiency (without annual maintenance)	*70% efficiency (after annual servicing)*	*80% efficiency (annual servicing & retention head burner)*
Fuel consumption (litres)	4,783	4,100[1]	3,587
Cost ($.41/litre)	$1,961	$1,681	$1,470
Annual savings	-	$281	$491
Cost ($.71/litre)[2]	$2,296	$2,911	$2,547
Annual savings	-	$485	$849
Cost ($1.1)/litre)[3]	$5,261	$4,510	$3,945
Annual savings	-	$751	$1,316

1. Annual national average of oil consumption for homes north of 60th parallel.
2. This price of 71¢/litre is a conservative projection for home heating oil in 1990.
3. This price of $1.10/litre is a pessimistic projection for home heating oil in 1990.

The Air Vapour Barrier

One of the most crucial components of energy-efficent building is the air-vapour barrier which, as the name implies, prevents the infiltration of cold air through the walls and ceiling and blocks the movement of water vapour from the house. This is usually achieved by the use of 6 mil polyethylene inside the insulation.

The installation of an air-vapour barrier requires care and attention to detail to ensure the seams and penetrations are well sealed and the air-vapour is not inadvertently punctured by nails.

In existing homes, it is often difficult to determine how effective your air-vapour barrier is, since it is inside your walls. One method to help you assess the condition of the air-vapour barrier is to have a pressure test done on your house. In a pressure test, a device is placed on your door, all obvious sources of leakage are plugged, and the air pressure within the house is dropped slightly. This small drop in interior pressure greatly increases the rate of infiltration as air is literally sucked into the house through every crack and crevice.

The air pressure test is a handy tool which helps determine where trouble spots in the house are and can precede any energy-efficient work, particularly air sealing, as it can point to the locations most in need of caulking and weatherstripping.

Without an air-vapour barrier the insulation on your house will act as an air filter, purifying the air and slowing down infiltration but not eliminating it. The same is true for the house with an air vapour barrier in poor condition, one which was put up carelessly and is full of large and small holes.

The air vapour barrier must be placed on the warm side of the wall. For retrofitting there is a rule-of-thumb called the ⅓ - ⅔ rule. Very simply it means that at least ⅔ of the insulation must be placed on the cold side of the air-vapour barrier.

The rationale for this has to do with a concept called the dew point. The dew point is the temperature at which water vapour in the air will condense into water.

In winter the temperature inside the wall will drop quickly as one moves from interior to the exterior. At some point in the wall - depending on the weather outside - the temperature will cause the water vapour to condense. This is the dew point.

If the dew point is on the cold side of the air-vapour barrier then the water vapour will be prevented from reaching it. In other words, the water vapour will not condense in the wall or ceiling.

However, if the air vapour barrier does not have enough insulation on its cold side, the dew point - which will move within the wall as the outside temperature changes - will be found at times inside the air-vapour barrier.

When this happens, the water vapour will condense inside the wall. This can result in serious problems; the insulation will become soaked and compacted thereby reducing its insulating value. In addition, the water will become trapped in the wall and will begin to rot the studs, causing deteritoration of the drywall and possible mildew.

Proper and careful placement of the air-vapour barrier will prevent these problems, and will ensure that the air vapour barrier will be a valuable component of your energy conservation measures.

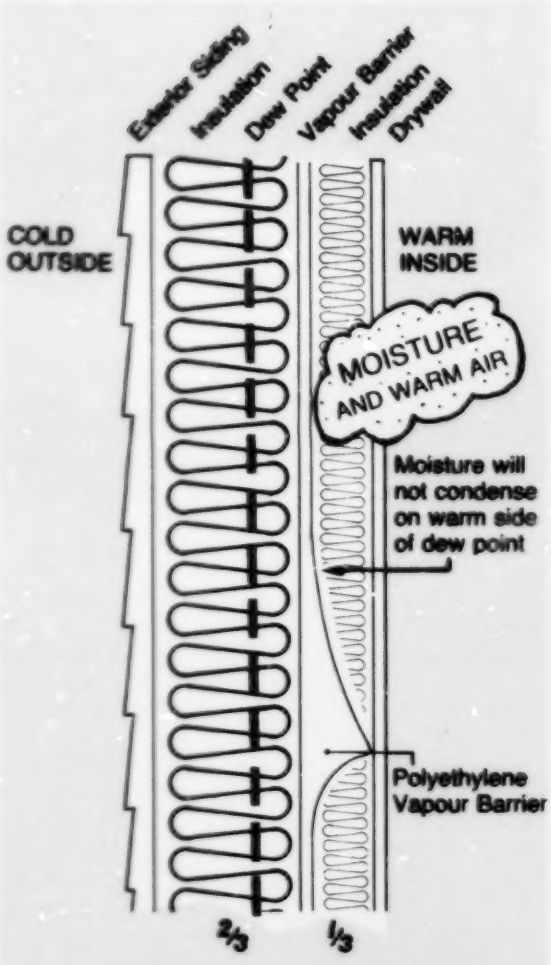
Controlling Humidity Problems

Once your house is tightly sealed, the humidity levels within will rise. For many houses in Yukon this will be a benefit during the dry winters. But for some houses it may be a problem depending on how tight it is and on the lifestyle of the occupants. Moisture levels are about right if only a slight amount of condensation appears on the side of your coldest window in winter. Excessive humidity can cause frosting and fogging of windows, staining of walls and ceilings, paint peeling and mould.

To control humidity, if it should be a problem, start by reducing the amount of water vapour generated in the house. Shut off all humidifiers and vent the clothes dryer directly outside, or through an air to air heat exchanger. Use your kitchen and bathroom fans and make sure they are vented outside or through a heat exchanger. For almost all houses this will ensure that there are no problems from excess humidity.

Air sealing, when done on the interior of the house, will prevent moisture problems in the walls. Sealing in the attic, around fixtures and attic hatches will limit the moisture entering the attic. But homeowners should insure adequate ventilation in the attic by checking that gable openings are free of obstruction or in the case of houses without gable ventiltation, providing for it.

Maximum comfort in the house is guaranteed by having the right balance of both fresh air and humidity, and the key to this is control. A well sealed, well insulated house will allow the homeowner, and not the prevailing winds, to control the temperature and humidity levels inside.



One third - Two thirds Rule:
Proper placement of the air vapour barrier will prevent moisture problems

The Super Insulated Retrofit

The super-insulated retrofit is a generic term referring to the construction of a tightly sealed, well insulated envelope around an existing house. It is a radical approach to energy conservation, expensive and probably will not be considered unless the house is in need of expensive repairs such as new siding or roofing or unless the homeowner is considering extensive renovations.

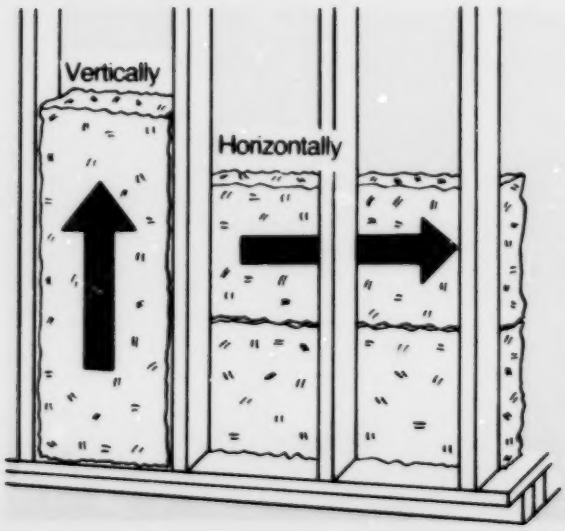
Two approaches are common: a total re-wrap encompassing the walls and roof, or simply new wall construction, a less expensive alternative. The first option requires cutting off the eaves and excavating a trench around the perimeter of the house. An air-vapour barrier covers the entire building from the peak of the roof to below-grade and then a frame shell is constructed. The shell, which is a light construction and does not add significantly to the weight of the house, is built using either a truss system or a curtain wall in order to provide a cavity to fill with insulation.

The major disadvantage of the super-insulated retrofit is the cost. In Yukon the cost of a retrofit including new walls has ranged from $14,000 to $17,000. Including the roof would add another $5,000 or $8,000 to the total.

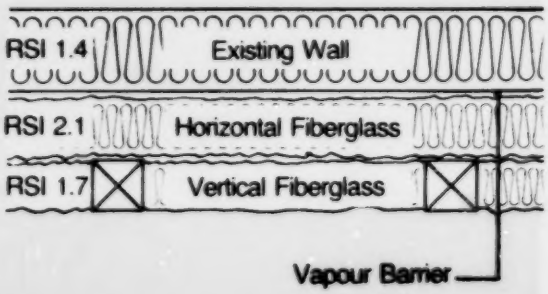
However, if the homeowner if going to replace the siding on the house and is thinking of insulating with styrofoam at the same time, then the incremental costs of the wall retrofit are quite low. Similarly, if renovations or repairs to the roof are to be made anyway, it might be the ideal time to look at the larger investment.

The advantages of the super-insulated retrofit are four in number: it is cheaper to do all the energy-efficient modifications at once rather than piece by piece: it will allow for greater insulation values and will also insulate below grade: it will extend the life of the structure and improve its market value by up to 10 per cent: finally, it can cut heating costs by 80 to 90 per cent.

As a final note on the subject, it has been predicted that the average annual cost of home heating in Yukon will rise from today's $1,700 to somewhere between $2,900 and $4,800 by 1990. Today's investment, therefore, could be saving the homeowner $4,000 per year by 1990.



Insulating the Double Wall



Planning Your Strategy

Any retrofit program has to be tailor-made for the individual house and the individual homeowner. Every homeowner has different plans and expectations for his or her house. Similarly, every house is different. Each has its own special needs, its own set of problems. Even houses of similar age and style often have quite different retrofit requirements.

How do you figure out what's best for your house?

Step One - **Take An Inventory**

High fuel bills are the most obvious sign that your house is using more energy than it should. But where are the losses occurring? The only way to find out is to make a careful inspection of the entire house. This is the purpose behind requiring an energy audit or HOTCAN analysis. You can also supplement this analysis by making your own visual inspection.

Check the weatherstripping around doors and windows that open. Remember weatherstripping deteriorates with time. Look for drafts around all openings and penetrations.

Does your house suffer from excessive condensation indicated by frost build-up in the attic, significant condensation on the windows or discolouration of drywall or plaster?

Make an inventory of the amount and type of insulation in every part of your house. You can often see what is in the wall by removing air register covers, or looking through the gap where the sink waste pipe penetrates the outside wall. You may have to remove part of the wall covering or drill a hole in an out-of-the-way place.

Is there any insulation at all? If so, is it in good condition? Or is it compacted, settled, wet? Check all these things, and note the type and condition of your doors and windows.

These are only some of the things you should look for. Inspect - or have a tradesman inspect - your plumbing and wiring. It is in good condition or does it need upgrading? Check metal fixtures in the attic for pitting, holes, or corroded edges. Check the insulation, attic joists, and roof interior for wet or discoloured areas. Repair any moisture damage and eliminate the cause. Moisture can corrode wiring and create a fire hazard. Are there any structural problems? A leaky basement? Rotting wood members?

Finally, make note of any needed renovations that could be combined with retrofit measures.

Step Two - **Examine the Options**

Retrofitting is more than just adding insulation. It can be anything from sealing air leaks to having your furnace tuned to adding an insulated shell to the exterior of the house.

The expensive, elaborate measures are not necessarily the best ones to take. To learn about the possible retrofit options, read some of the publications listed at the back of this booklet.

Step Three - **Evaluate the Options**

You may reject some of your options outright if you feel they're too expensive or not feasible. But once you've developed a list of reasonable options, it's time to evaluate each one in detail.

Determine the costs and benefits, and the available financing, for your plans. Calculate how long it will take for your initial costs to be repaid through lower fuel bills. Determine how the cost of each retrofit measure will fit in with your overall budget. There are many ways to finance home retrofit projects, including loans and grants from various levels of government. Investigate them all.

Consider the available materials and labour. In some areas it may be difficult or expensive to obtain specialized services or materials.

Decide whether you'll do it yourself or hire a contractor. You can save a lot of money by doing it by yourself, but if you aren't reasonably experienced or if you can't spare the time, your best bet is to hire a professional.

Decide whether renovation will be necessary. If your house needs sprucing up, you can save time and money by renovating and retrofitting at the same time. If your retrofit plans entail major renovations, however, you should think twice about the overall cost.

Step Four - **Draw up the Plan**

Once you've selected measures for each heat loss area, it's important to develop an overall plan. Analyze each measure to determine the order in which you will retrofit.

Safety Tips

Insulation
When working with loose fill or batt insulation:

- wear goggles and a non-toxic particle mask.
- wear long sleeves, tight cuffs and loose, thick clothing to avoid skin irritation.
- don't smoke near insulation, dust or fumes.
- vacuum up dust and fibres. If sweeping, dampen the debris first to stop particles from becoming airborne.
- vacuum clothing so you don't spread insulation particles throughout the house. Keep work clothes separate, especially in the wash.

Attic

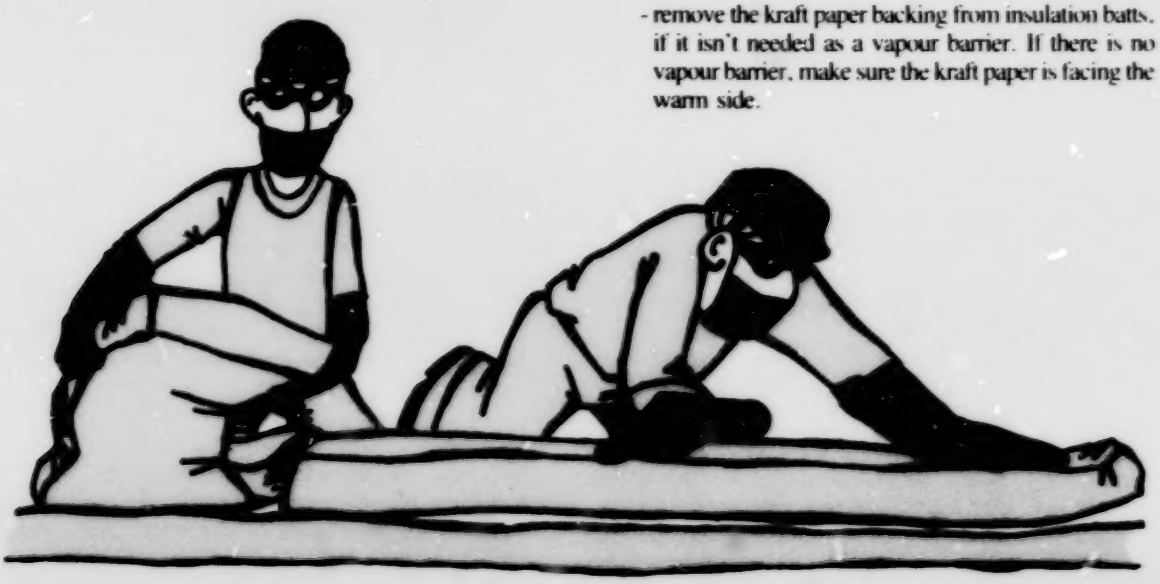
- provide good lighting. Use a wire-enclosed trouble light.
- place a board across the joists to form a walkway. DO NOT STEP BETWEEN JOISTS IN THE ATTIC.
- to avoid odour or toxicity problems, ask your hardware or lumber dealer for the proper caulking compound for use in enclosed spaces

Electrical Work

- obtain the necessary permits and consult an electrical inspector before you start.
- DO NOT try to make repairs unless you're qualified.
- BEFORE making repairs, TURN OFF the power at the breaker or fuse panel. Check to make sure the power is disconnected by plugging in a lamp or radio.

To Avoid a Fire Hazard

- have your wiring and electrical fixtures checked by a qualified electrician or inspector before retrofitting.
- DO NOT insulate within 150 mm (6 inches) of the chimney. Construct a box around the chimney. This is especially important if you're installing loose fill insulation.
- DO NOT insulate closer than 150 mm (6 inches) from any exhaust fans, electrical motors or other heat sources.
- remove recessed lighting fixtures wherever possible.
- remove the kraft paper backing from insulation batts, if it isn't needed as a vapour barrier. If there is no vapour barrier, make sure the kraft paper is facing the warm side.



Codes and Bylaws

Before you start major renovating or retrofitting work, make sure your plans meet all the applicable codes and bylaws. These regulations are designed for your safety and protection.

Whitehorse residents should contact the Building Inspectors at the City of Whitehorse regarding codes, permits and inspections for residential upgrading, building, electrical, mechanical and plumbing. Outside of Whitehorse, homeowners should contact the Yukon Government, Department of Municipal and Community Affairs.

For regulations concerning wood burning appliances and fire safety information contact either the City of Whitehorse or the Government of Yukon.

If you move or have to change utility connections, you must contact the utilities and have them disconnect and re-connect the services. You will have to employ qualified tradespeople to do the actual moving or extension of the pipes or conduits. Do not attempt to do this work yourself.

Make sure that your contractor uses only Standards Council of Canada approved materials. Check for the Canada Mortgage and Housing Corporation (CMHC), Canadian Standards Association (CSA), Canadian General Standards Board (CGSB), or Underwriters Laboratories of Canada (ULC) acceptance numbers.

When you hire a contractor to do plumbing, electrical, or oil furnace work, the contractor is responsible for having the work inspected by the appropriate authorities. A certified inspection tag is usually affixed to the work that has been approved by an inspector. Ensure that the contractor has the work approved by the appropriate inspectors.

Hiring a Contractor

Depending on the type of retrofit you plan, you may want to hire a contractor to do part or all of the job. Before you do however, make sure you know exactly what you want done. Discuss the project with your family, make note of all the points which come up, then take the time to write down a complete description of the work you want done.

If there are a number of different types of jobs to be done in your home it may be wise to hire a contractor who will supervise all the subcontractors, particularly if you are inexperienced in co-ordinating such jobs.

The contractor is responsible for obtaining building permits, carrying out all of the work described in the contract (unless he has written authorization for changes) maintaining public liability and property damage insurance and workman's compensation; paying workers, suppliers and subcontractors; and supervising the quality of all the work that is done.

If you do decide to hire a contractor:

- make sure you are aware of the different products available, their properties and costs
- choose a contractor with CGSB and Yukon Retrofit certification
- obtain at least two written estimates showing the type of materials to be used, cost of labour and the cost of the project
- ask the contractor for names of previous clients and phone these people to ask about the work which was done for them
- before awarding the contract, call the Worker's Compensation Board. Employers must pay premiums on behalf of their employee. A check with the board will determine if they are keeping up with their account. Overdue accounts could be a liability to you.
- before signing a contract make sure you know the total project cost. If you are only quoted for labour and you supply the material you could end up being liable for the compensation premiums of the contractor and his employees. The contractor is responsible for these under the "total price contract."
- obtain a written contract outlining materials to be used, total costs and completion date. Do not accept a contract that uses "approximately" or similar words related to the price.
- in the contract it should state that the contractor is responsible for the clean-up after the job.
- it is standard to pay 10 per cent down and 70 per cent installments. The final 20 per cent is payable within 30 days of completion.
- get legal advice before signing contracts for large projects.
- if your contract calls for progress payments, be sure work claimed is completed before paying. If there is a dispute, don't pay before it is settled.
- before making progress payments, have a contractor sign a statutory declaration stating that his creditors and employees have been paid for the work done. Unpaid creditors can make claims against your property.
- remember, price isn't everything - someone can always give you a lower price - but it isn't the best price if it doesn't do the job you want done.

Whether it is called an "offer," "tender," "quote," "bid," "estimate," or "contract," a piece of paper that describes certain work to be done and gives a price for it becomes a legal document that is binding on both parties once they have signed it. Obtaining specific estimates with the details in full, as outlined above and in the illustration below should remain with the contract.

Many homeowners seem uneasy about questioning quotations or advice given by contractors. Remember, it's your home, your money, and your satisfaction. You have the right to ask and every reputable contractor will answer your questions.

Estimate No. 1

CONTRACTORS NAME _____

ADDRESS _____

TELEPHONE _____

WORK TO BE DONE	MATERIALS USED	STARTING DATE	COMPLETION DATE	MATERIAL COST	LABOR COST

Other Financial Assistance

A number of loan and grant programs exist to help defray the cost of retrofitting and other upgrading activity. As each program has particular eligibility requirements, check with the appropriate organization before undertaking work.

CHIP - *Canada Home Insulation Program*

Sixty per cent of the cost of eligible insulation and sealing materials or the combined cost of eligible materials and labour to a maximum of $500 is contributed through this federally-funded program. Minimum insulation values of RSI 6 for attics and RSI 2.1 for basements are required. Principal residences that are three storeys in height or less, built before September 1, 1977, are eligible.

Under this program, only contractors listed in the CGSB National Certification Program are eligible to perform CHIP funded work. All available subsidies from the CHIP program must be used before applying for SEAL monies. Money obtained through CHIP is taxable. For further information contact:

Conservation and Renewable Energy Office
2078 2nd Avenue
Whitehorse, Yukon, Y1A 1B1
668-2828 (toll free: Zenith 2828)

COSP - *Canadian Oil Substitution Program*

Grants of up to $800 are provided for conservation measures and for conversion from oil or electrictiy as a heating source to less costly and more plentiful domestic energy sources. To the maximum limit, fifty per cent of eligible material, equipment and labour costs are covered by this taxable grant. Work done on or after October 28, 1980 is eligible. In some cases, both the CHIP and COSP programs can be used to maximize your grant although the same work cannot be claimed under both programs. For more information contact: the same office as for CHIP (see above)

RRAP - Residential Rehabilitation Program

This program funded by Canada Mortgage and Housing Corporation can provide forgivable loans of up to $5,000 and repayable loans of up to $10,000. Eligibility for forgivable loans is partly determined by annual income. The program is designed to help upgrade substandard houses through a variety of measures including installation of insulation. Landlords, non profit corporations and co-operatives as well as homeowners can receive assistance from this program. The program has two agents for its delivery.

In Whitehorse contact:

Yukon Housing Corporation
105 - 303 Jarvis Street,
Whitehorse, Yukon
Y1A 2H3
667-5645

For residences outside of the City of Whitehorse contact:

Norman Isaac,
Council for Yukon Indians,
22 Nisutlin Drive,
Whitehorse, Yukon
Y1A 3S5
667-7631

Home Improvement Loans

The Canada Mortgage and Housing Corporation will guarantee a home improvement loan to a maximum of $10,000 from a bank or other lending agency. The amount of the loan is limited according to the appraised value of the home after improvements. Mortgage security is required on loans over $10,000. For more information contact your bank, credit agency or CMHC.

Suggested Additional Readings

1. Brian Marshall and Robert Argue: **The Super Insulated Retrofit Book,** Renewable Energy in Canada. Available from Energy Information Centre, or local bookstore. *$10.95*

2. Robert Argue: **The Well-Tempered House: Energy Efficient Building for Cold Climates,** Renewable Energy in Canada. Available from Energy Information Centre, or your local bookstore. *$10.95*

3. D. Eyre and D. Jennings: **Air-Vapour Barrier,** Saskatchewan Research Council. Available from Energy Branch, Government of Yukon. *No charge.*

4. Harris Mitchell: **How to Hire a Contractor,** Canada Mortgage and Housing Corporation. Available from Energy Branch, Government of Yukon. *No charge.*

5. Kevin Shackell and David Arseneault: **Low Energy Home: the Double-Wall Approach,** Energy Information Centre and Energy Branch. Available from Energy Branch, Government of Yukon. *No charge.*

6. Yukon Conservation Society: **Yukon Energy: A Directory of Yukon Energy Conservation Supplies and Services.** Available from Energy Information Center. *$1.95*

7. Canada Mortgage and Housing Corporation: **Condensation in the Home: Where, Why and What to do about it.** Available fron CREO office. *No Charge.*

8. Canada Mortgage and Housing Corporation: **Energy-efficient Housing Construction.** Available from CREO Office. *No charge.*

9. Alberta Department of Energy and Natural Resources: **Low Energy Home Designs.** Available from Energy Branch, Government of Yukon. *No Charge.*

10. Alberta Department of Energy and Natural Resources: **Energy Efficient Housing - A Prairie Approach.** Available from Energy Branch, Government of Yukon. *No charge.*

11. Energy, Mines and Resources Canada: **Enerfacts.** A series of small, helpful publications on energy conservation. Available from CREO office. *No charge.*

12. Energy, Mines and Resources: **Keeping the Heat in.** Available from CREO office. *No charge.*

13. Energy, Mines and Resources, Canada: **The Billpayer's Guide to Heating Systems.** Available at CREO office. *No charge.*

Energy Information Centre
302 Hawkins Street
Whitehorse, Y1A 1X6
668-5678

CREO 2078 2nd Avenue
Whitehorse, Y1A 1B1
668-2828 (toll free: Zenith 2828)

Energy Branch
Department of Economic Development, Tourism
Government of Yukon
P.O. Box 2703, Whitehorse Y1A 2C6
668-5471 (toll free: Zenith 3003)

POOR

QUALITY

ORIGINAL